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## A NEW SPECIES OF CLATHRIID SPONGE FROM THE SAN JUAN ARCHIPELAGO

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### INTRODUCTION

In the course of investigating the cytology of clathriid sponges a new species from the San Juan Archipelago, Washington, has been found. On the basis of skeletal and field characteristics this form appears to be identical to chela-containing sponges described by de Laubenfels (1927) from California as variants of *Ophlitaspongia pennata* (Lambe, 1894). Cytological evidence reviewed here (see Simpson, in press, for detailed discussion) establishes that the chela-bearing sponges are not conspecific with *O. pennata*.

### METHODS

Spicule preparations were made by digesting a piece of the sponge in hot, concentrated nitric acid. This was followed by repeated centrifugation and resuspension in distilled water. The spicules were then dried on slides and mounted. Hand sections were cut with a razor blade, stained in a saturated solution of basic fuchsin in 95% ethanol, mounted and examined. Routine histological procedures and histochemical staining were employed for studying cell types and microanatomy (see Simpson, in press, for details of methods).

## DESCRIPTION

*Axocielita hartmani* new species

HOLOTYPE: YPM<sup>1</sup> No. 5075. Kilpatrick's shore, San Juan Island, San Juan Archipelago, Washington, U.S.A.

HABITAT: A single specimen was collected growing on a rock substratum at two feet below mean low water level.

FURTHER DISTRIBUTION: De Laubenfels (1927) has reported the occurrence of chela-containing specimens of *Ophlitaspongia pennata* from the Monterey Peninsula in California. These sponges are believed to be identical to *Axocielita hartmani*.

SHAPE: The specimen is incrusting, measuring 30-35 mm in thickness and covers an area of 20 square cm. No upright processes are present.

COLOR: The living sponge is bright red in color. When preserved in alcohol, its color is drab.

CONSISTENCY: In both the living and preserved condition the sponge is firm, almost brittle.

SURFACE: The surface of the sponge possesses numerous small pores which are irregularly shaped and randomly distributed. In addition, there are larger depressions each of which is partially covered by a thin translucent membrane. Some of the latter are subspherical in shape while the remaining are elongate. These larger depressions appear to be oscules (FIG. 1).

ECTOSOME: At the surface of the sponge are spicule pluses usually formed of three or four thick styles standing erect. The points of these styles protrude approximately  $50\mu$  beyond the surface. The heads of the styles are embedded in spongin fibers which end at or just below the surface. Erect, thinner styles occur along with the thick ones in some of the pluses. Thin and thick styles are also present at the surface without any particular orientation. There is no distinct class of spicules present only in the ectosome.

ENDOSOME: Basally there is a layer of spongin in contact with the substratum. Ascending fibers, 50 to  $70\mu$  in width, originate from the basal layer and course upwards, ending at or just below the surface. The ascending fibers are exceedingly thin and translucent, and one gets the impression in viewing hand sections that

<sup>1</sup> YPM = Peabody Museum of Natural History, Yale University, New Haven, Connecticut.

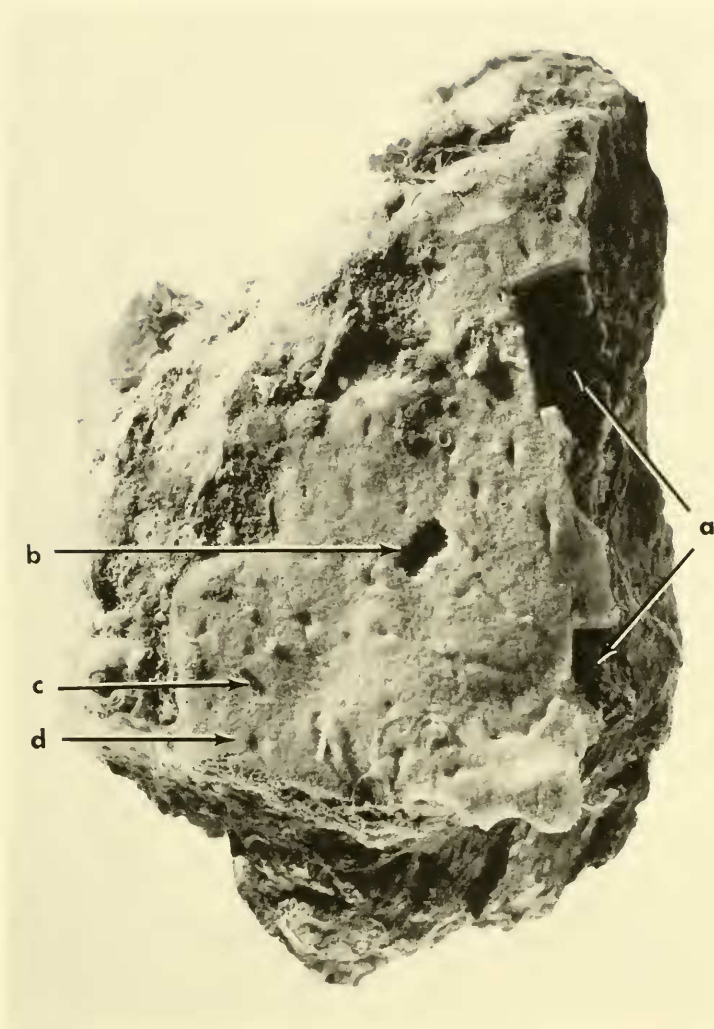


FIG. 1. Surface view of the holotype of *Axocielita hartmani* n. sp. The sponge is attached to a rock substratum. At *a* and at *b* are areas from which tissue was removed for analysis. Numerous small pores are just barely visible on the surface. Oscules occur either within elongate depressions (at *c*) or in subspherical depressions (at *d*).  $\times 1.6$ .

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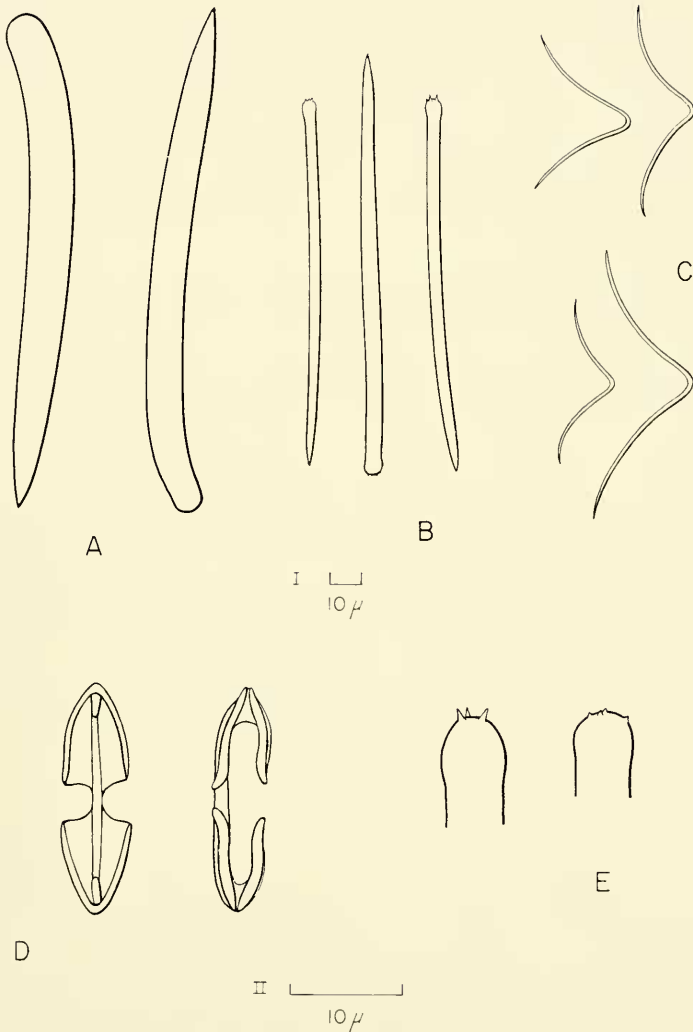


FIG. 2. Spicule types present in *Axocielita hartmani* n. sp. A. Thick styles. B. Thin styles. C. Texas. D. Palmate isochelas. E. Microspination present on the heads of thin styles. Scale I: A, B, C. Scale II: D, E.

there is very little spongin present. Thick styles lie partially embedded in the ascending fibers and protrude, with pointed ends out, at various angles from them. The ascending fibers are linked

one to another by short spongin fibers which also contain thick styles partially embedded within them. These cross bridges are thin ( $20.0$  to  $50.0\mu$ ) and usually contain only one, two, or three spicules. The bridges measure approximately  $150$  to  $200\mu$  in length: i.e., the length of one thick style. Randomly distributed throughout the tissue of the sponge are thin styles, toxas, and palmate isochelas. Rarely, thin styles are also found partially embedded in the tracts of spongin fibers.

**SPICULES:** Two categories of megascleres and two of microscleres are present in this species. The megascleres include two categories of styles which can be distinguished on the basis of the width of the spicule and on the presence or absence of microspination on the head of the spicule. Thick styles possess smooth heads with no swelling. The shaft of thick styles is usually slightly curved. Thin styles possess one to five minute spines on the head of the spicule. In most cases the heads of thin styles are subtylote. The microscleres include numerous palmate isochelas and less numerous toxas. The morphology of the toxas is quite variable. They are oxyote with a deep, rounded arch. Some, however, approach a v-shape due to the height of the arch above the arms (see FIG. 2.) Measurements of the four spicule types follow:

Thick styles:	$156.0-177.8-228.8$ X $11.9-15.7-19.0^{\pm}$
Thin styles:	$130.0-154.9-193.4$ X $4.8-5.9-10.2$
Palmate isochelas:	$19.0-21.7-23.8$
Toxas: distance	
between tips	
of arms:	$27.3-69.3-121.4$
height of arch	
above arm tips:	$11.1-20.7-43.1$

#### DISCUSSION

In its skeletal features, *Axocielita hartmani* resembles *Axocielita linda* de Laubenfels (1954, p. 156) described from the Marshall and Caroline Islands. The latter species differs from *hartmani* by growing as an exceedingly thin crust, by containing two sizes of toxas, by possessing some contort palmate isochelas, and by having tylostyles as megascleres.

<sup>±</sup> Measurements in microns. Means (in italics) and extremes of 25 spicules in each category.

De Laubenfels (1927), in discussing a number of intertidal, incrusting, red sponges from the Monterey Peninsula, California, remarked on the variation in spiculation in *Ophlitaspongia pennata*. He found some specimens which contained palmate isochelas and others which lacked them; he designated both types of specimens as *pennata*. The two forms occur together on San Juan Island as well and are strikingly alike in the field. Both have an incrusting mode of growth and are red in color. Skeletal similarities include the presence in both of smooth coring styles, toxas, anastomosing spongin fibers, and thin interstitial and dermal styles. On the basis of skeletal and field characteristics one might conclude, as did de Laubenfels, that the two forms belong to a single species. However, in addition to the fact that *A. hartmani* has chelas and *O. pennata* lacks them, there are marked cytological differences between the two sponges (Simpson, in press). In these characteristics the latter species bears a close relationship to *Microciona atrasanguinea* Bowerbank (1862), the type species of *Microciona*.

The generic placement of *hartmani* is difficult. On the basis of skeletal and cytological characteristics *hartmani* cannot be placed in *Ophlitaspongia*, *Microciona*, or *Thalysias* (Simpson, in press). Unfortunately, cytological data are lacking for the type species of a number of additional genera (see Lévi, 1960) which could include *hartmani*. I have decided to place *hartmani* in the genus *Axocielita* (de Laubenfels, 1936, p. 118) at this time because, on the basis of skeletal characteristics and growth form, this new species fits into *Axocielita* better than into any other previously established genus.

Hechtel (1965, p. 43-44) has argued that the type species of *Axocielita*, *Microciona similis* Stephens (1915), should be restored to the genus *Microciona* because it possesses spiny styles. He furthermore states that the remaining species in *Axocielita* can then be transferred to the genus *Axociella* Hallman (1920). If this conclusion is accepted, *hartmani* would be placed in *Axociella*. Because the type species of *Axociella* is a very distinctive, branching sponge with an axial core of spongin, quite unlike *hartmani* (and also unlike *Axocielita linda*) I see no reason for dropping *Axocielita* until additional non-skeletal data demand it. This means that either Hechtel's conclusion that the type species of *Axocielita* actually belongs in the genus *Microciona* must be set aside for the

time being, until additional characters are studied, or a new genus must be established to receive *hartmani* as well as *linda*. I have chosen the first course, the retention of *Axocielita* with *similis* as the type species, until additional information is available. This course is necessary since I have redefined the genus *Microciona* on the basis of cytological features (Simpson, in press) and it is inconsistent to return *similis* to *Microciona* without first having cytological data. In addition, I have found (Simpson, in press) that the presence of spiny styles is not correlated with the nature of the special cell types.

Lévi (1960, p. 60) has expressed the opinion that in the family Clathriidae it is superfluous to erect or retain separate genera on the basis of the presence or absence of chelas alone. However, in the case of *Axocielita hartmani* the presence of chelas is associated with cytological characteristics distinct from those found in *Microciona pennata* and therefore I have separated this sponge from *Microciona pennata* at the generic level. *Microciona spinosa* Wilson (1902) possesses the same skeletal features as *Axocielita hartmani*, but the cytological features in this species are like those in *Microciona atrasanginea*, thus confirming Wilson's original placement of the species in *Microciona*.

The latter finding reinforces a conclusion which can be drawn from the present work: in the absence of additional characteristics (histological and cytological) one has no basis for deciding whether the presence or absence of chelas reflects an underlying, more deeply rooted similarity or difference between species. Therefore generic separations or mergers on this basis become a matter of preference rather than a reflection of relationships. The present work and that soon to be published elsewhere leads to the unhappy conclusion that in some cases taxonomic decisions which are based only on skeletal characters and growth form are not indicative of taxonomic relationship below the family level.

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